EE/CprE/SE 491 WEEKLY REPORT 04

Video Pipeline for Machine Computer Vision

10/04/24 – 10/10/24
Group number: sdmay25-01
Advisors: Dr. Jones and Dr. Zambreno
Client: JR Spidell

Team Members:

Lindsey Wessel — *ML Face & Eye Detection*
James Minardi — *Hardware*
Eli Ripperda — *Embedded Systems*
Mason Inman — *Semantic Segmentation Optimization*

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Weekly Summary:

This week, we made progress despite our time constraints. Mason worked on RITnet and DenseNet models, while discussing GPU training with JR. Eli is preparing a Tensil.ai presentation, and James connected to the Ultra96 board's Jupyter server and is working on connecting to its JTAG console interface. Lindsey shared her research on face detection with the team after her research. Time management is still a challenge due to midterms.

Past Week Accomplishments

- Lindsey's Accomplishments
  - Continued research on Detecting Faces
    - AdaBoost & Cascade Classifiers
  - Started researching how to locate the ROI (human eyes)
- James' Accomplishments
  - Worked on setting up the Ultra96. Can boot up the PYNQ environment and connect to its internal server that hosts jupyter notebooks.
- Eli's Accomplishments
  - Determined my next near-term deliverable, which is a presentation on Tensil.ai to present at our next client meeting.
- Mason's Accomplishments
  - Discussed GPU training constraints with the client
  - Continued work and learning on the RITnet and densenet models. Additionally, I obtained an adapter to allow the SD card to be connected to Mason's personal laptop, which allows for continued work with client hardware.
- Team Accomplishments
  - Worked as a team and with the client to build a high-level system diagram.

Pending Issues

- Lindsey's Issues
  - Lack of available time to dedicate to the project
- James' Issues
  - No issues
- Eli's Issues
  - Time is a challenge for me – with a handful of exams, interviews, and other course project work, I am finding it difficult to dedicate hours to this project for now.
  - See team issues.
- Mason's Issues

- Finding time to dive into the algorithms as I manage my time with upcoming exams is a near term worry of mine.

- Team Issues
  - Waiting on NDA from the client.

Individual Contributions

Name	Cumulative Hours	Week 4
Lindsey	54	6
James	46	6
Eli	46	6
Mason	54	6
Team	200	24

Forward Plan

- Lindsey's Plan
  - Start researching other forms of Face & Eye Tracking algorithms
- James' Plan
  - Boot ultra96 via JTAG to access the console environment. Ensure connection to the internet.
  - Set up remote access using the documentation slide deck provided by the previous team.
  - Pass files from the PC to the board, then use the Jupyter Notebook to access that file from the board.
- Eli's Plan
  - Research Tensil.ai (our FPGA image generator), develop a presentation on it, and present it to the team and client.
  - Stretch goal: Begin working with Ultra96 to run Linux on it.
- Mason's Plan
  - Go through the SD card provided by the client and see what can be used.
  - Continue to train the base RITnet model to gain an understanding of the process and how it works.
- Team Plan
  - Continue research in individual areas. Consolidate information for future meetings and begin breaking down the design.

Advisor Meeting Notes

This week, we sat down with Dr. Zambreno and discussed the following:

- How much of the client's high-level solution should we include in our class assignments, including the design document?
  - We were including the whole wheelchair system; however, we were guided to go into more detail on specifically what we are working on.
- We discussed who our users are.
  - Since we will be long graduated when our subsystem gets tested with real end users, who is our near-term user? We were guided to implement focus on the "next senior design team" so that they can easily pick up work where we left off.
- Dr. Zambreno enlightened us on the audience and environment of our end-of-semester presentation so that we are better prepared for it and optimize our efforts now so that we have less to do later.
  - Dr. Zambreno shared the importance of graphs/diagrams in our presentation and recommended that we make graphs and diagrams early so that we can have a few iterations before our presentation. This is to ensure the accuracy of our graphs and diagrams.
- We updated our advisor on our current progress with the hardware, which is not extravagant.
  - Dr. Zambreno recommended that we find a couple of hours, sit down, and get acclimated to the board – that we implement some "Hello World" programs on it.

Client Meeting Notes - 10/6

This week, we sat down with JR and discussed the following:

- Segmentation Training
  - This can be done in any environment with any hardware (GPU acceleration).
  - Mason needs to figure out CLAHE object issues.
- Initializing the FPGA
  - 96 via JTAG to access the console environment. Ensure connection to the internet.
  - Set up remote access using the documentation slide deck provided by the previous team.
  - Pass files from the PC to the board, then use the Jupyter Notebook to access that file from the board.
  - Eli to create slides to teach the team about research in Tensil.ai
  - James to create slides to teach the team about Computer to FPGA pipeline
- Eye Locating
  - More research needs to be done to compare the efficiency of algorithms